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Speed Alert System for GPS-enabled Smartphone's with Android operating system

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Abstract-With the rising penetration of Smartphone's in the growing market, mobile multimedia data content is becoming the dominant form of information that people produce and consume on a daily basis. In this paper we present a application which collects speed and location information from the Global Positioning System (GPS), used the Google Maps Application Programming Interface (API) to determine the location of nearby schools, and gives an alarm if a person drove over the speed limit in a school zone. The platform has the ability of supporting a melding of different services, and we believe such Smartphone's will have broad application to public safety problems.

Keywords
Android, Global Positioning System (GPS), Google Maps Application Programming Interface (API), Speed Alert System, Public Safety Smartphone.

1. INTRODUCTION

Smartphone's have become ubiquitous as newer, less expensive models with greater feature sets have been released. While much attention has been given to the danger posed by drivers distracted by talking on the phone or sending text messages, responsible application of Smartphone technology could have a net positive effect on public safety.

As we all know that now a days android platform is used by most of the people, as it is an open source so it provides a convenient environment to develop an application. We explored the Android Operating System (OS) and software development environment and evaluated several of its capabilities by constructing a working application. As our project name i.e. Area sense alert by GPS and android suggests that we would be using GPS and android device in our project. In this project we are developing an android application, this application will be used to collect the speed and location of the user with the help of Global positioning system receiver. We also use Google maps API (Application Programming Interface) for determining the location of the near by schools, hospitals or any speed restricted zones. Whenever a person crosses the speed limit in the speed restricted zones, he will be immediately alerted by sounding an alarm. In this way the person will come to know that he is crossing the speed limit and he will be alerted to alter the speed. We believe that this application will provide a great benefit in public safety.

In our exploration of Smartphone technology, we developed a proof-of-concept system that addressed traffic safety in school areas and speed restricted zones. Our system addresses the need for drivers to be able to pay full visual attention to the road while still being alerted to the speed of the car. The system combined several of the features which are becoming more commonplace on Smartphone's as well as information retrieved from Internet services.

The rest of the project is structured as follows. We review the relevant technology and discuss a proof-of-concept system to increase public safety and its implementation. We give conclusion including a discussion of our future direction.

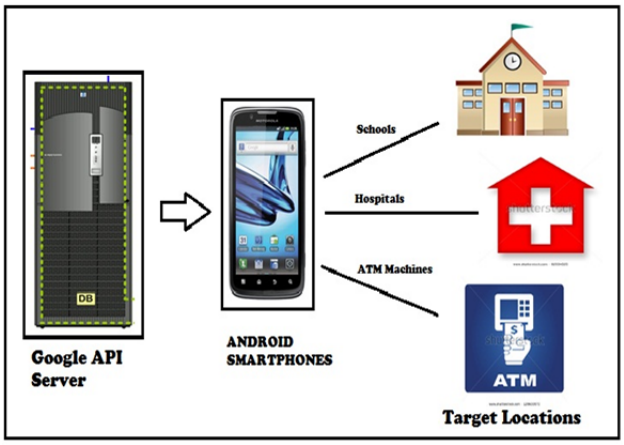

Figure 1.Speed alert system by using Android SmartPhones.

2. OVERVIEW OF ANDROID SYSTEM

Android is an operating system for mobile devices that are developed by the Open Handset Alliance. User applications are mostly written in Java and run on Android's own Java virtual machine (named Dalvik). Fig. 2 shows the Android architecture, which consists of the Linux kernel with device drivers and the Android runtime environment (along with a number of libraries) that support interactions between the Linux kernel and the high-level application framework. The application framework which released in a bundle as the Android SDK provides high-level Java interfaces for accessing the underlying resources, such as camera and Wi-Fi. For example, our video streaming application makes use of the activity manager to detect and respond to events when triggered. The use of standard development toolkit encourages interoperability between components and maximizes portability of the application.

In addition to the SDK, there is also a native development toolkit (NDK), which supports the use of native C or C++ codes in the applications. The NDK is an extension of the SDK to allow the development of lower-level source codes for more efficient data processing in the system. In our application, parts of the video encoding and decoding are implemented using the NDK to allow more efficient processing of video streams.

3. Android Architecture

3.1 Linux kernel

At the bottom of the layers is Linux - Linux 2.6 which has approximately 115 patches. This provides some of the basic system functionality like process management and memory management, it also provides functionality for device management such as camera, keypad, display etc. Also, the kernel handles all the things that Linux is really good at such as networking and a vast array of device drivers, which take the stress out of interfacing to peripheral hardware.

3.2 Libraries

On top of Linux kernel there is a set of libraries including open-source Web browser engine WebKit, well known library libc, SQLite database which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security etc.

3.3 Android Runtime

This is the third section of the architecture and available on the second layer from bottom. This section provides the key component called Dalvik Virtual Machine which is a kind of Java Virtual Machine specially designed and optimized for Android.

The Dalvik VM makes use of Linux core features such as memory management and multithreading, which is native in the Java language.

The Android runtime on top of that provides a set of core libraries which enable Android application developers to write Android applications using standard Java programming language.

3.4 Application Framework

The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are permitted to make use of these services in their applications.

3.5 Applications

You will find all the Android application at the peak layer i.e. at the top. You will write your application to be installed on this layer only. To give an instance of such applications are Contacts Books, Web Browser, Games etc.

4. Google Place API

The Google Places API is a service that returns information about Places — establishments, geographic locations, or important points of interest — using HTTP requests. Place requests is used for specifying locations as latitude/longitude coordinates.

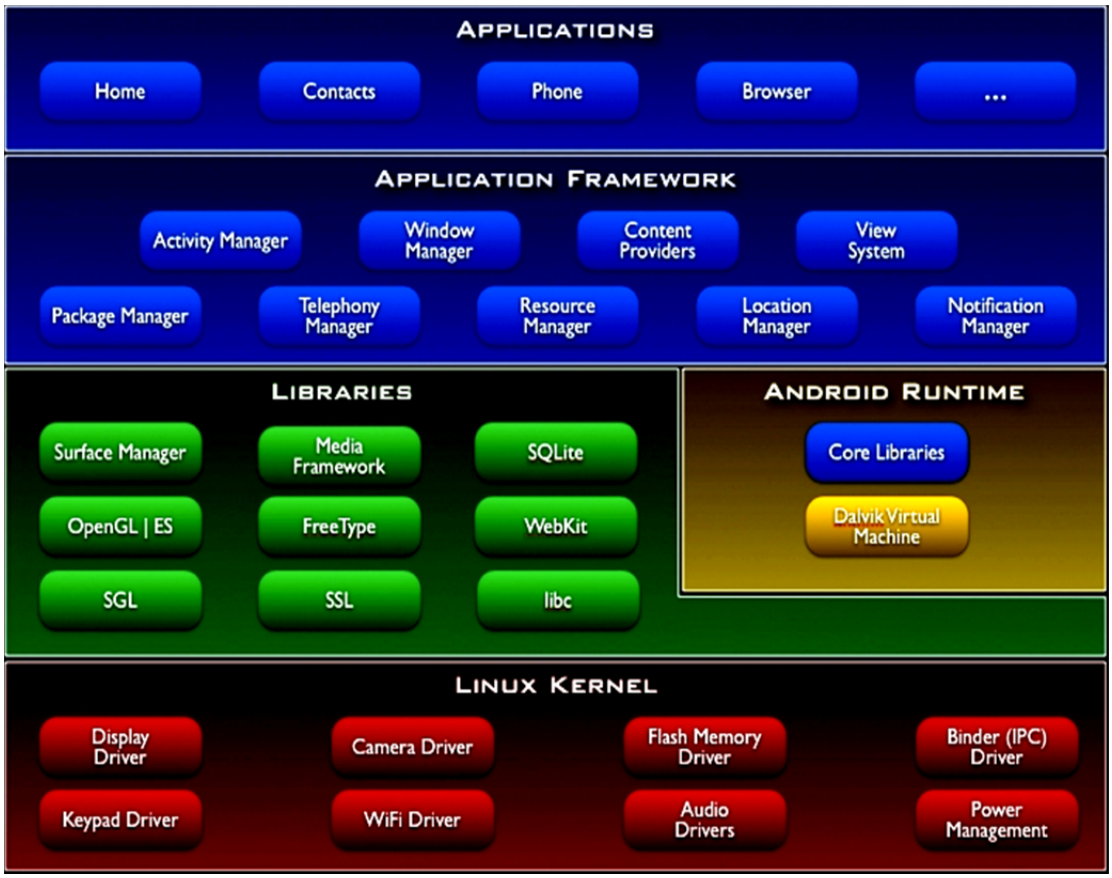

Figure 2: Android Architecture.

5. AUHTENTICATION IN GOOGLE PLACES API

Open The Google Places API which uses an API key to identify your application. API keys are managed and handled through the Google APIs Console. You'll need your own personal server API key before you can begin using the API. To actuate the Places API and create your key:

1. Visit the link of the Google APIs Console at https://code.google.com/apis/console and sign in with your Google account.
2. A default project called API Project is created for you when you first log in to the APIs Console. You can use the project, or create a your new project by clicking the API Project button at the top of the window and selecting Create.
3. Click the Services link in the left-hand navigation panel.
4. Click the status switch (the on/off button) next to the Places API entry. The switch will slide to ON.
5. Click API Access in the left-hand navigation panel.
6. Click Create new Server key.
7. Enter one or more server IP addresses if you wish to restrict the servers that can send API requests.

Click Create. Your API key appears under the heading Key for server apps (with IP locking).

5.1 Place API syntax

To match search terms against all of the content that Google has indexed for a Place, it includes the keyword parameter in your URL. For instance, to find places near downtown San Francisco with the keyword coffee in their names, the addresses or reviews and other information that Google associates or equates with Places, use the URL below:

```
https://maps.googleapis.com/maps/api/place/search/json
  ?keyword=coffee
  &location=37.787930,-122.4074990
  &radius=5000
  &key=YOUR_API_KEY
```

5.2 Downloading Google play services

Google made new Maps V2 API as a part of Google Play Services SDK. So before we begin developing maps it is essential to download Google play services from SDK manger. You can open SDK manager from Eclipse or from android sdk folder.

Open Eclipse ⇒ Windows ⇒ Android SDK Manager and check whether you have already downloaded Google Play Services or not under Extras section. If not then select play services and install the package..

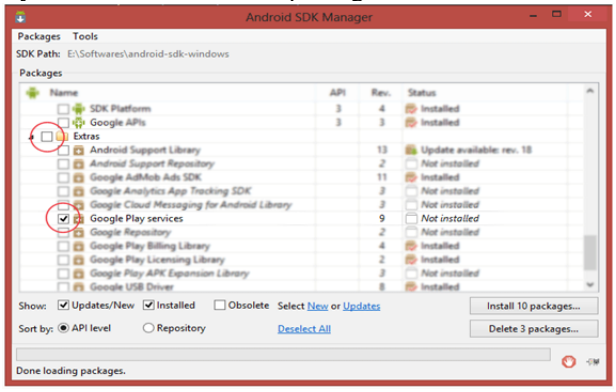

Figure3: Downloading Google Play Services.

5.3 Proposed alert system

The Proposed application collects speed and location information from the Global Positioning System (GPS) receiver, which uses the Google Maps Application Programming Interface (API) to determine the location of nearby schools, hospitals, military zone, silence zone.As well Proposed application will give an alarm if a person crosses the speed limit for the above mentioned areas and calculates speed of vehicle and if vehicle exceeds predefined maximum limit then it generates message and send alert to given mobile number.

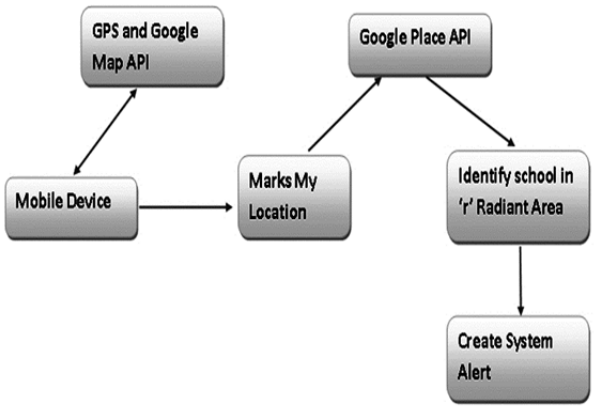

Figure 4: Block diagram of working architecture of speed alert system

6. ALGORITHM TO FIND SHORTEST PATH

The algorithm is used to decide shortest path between two places is Dijkstra's shortest path algorithm which is basically used to calculate minimum distance between two places as described in figure given below

Figure 5: Algorithm To Find Shortest Path

Dijkstra's algorithm is a solution to the single-source shortest path problem in graph theory. It is Works on both directed and undirected graphs. However, all edges should have nonnegative weights.

Approach: Greedy
Input: Weighted graph G={E,V} and source vertex v∈V, such that all edge weights are nonnegative
Output: Lengths of shortest paths (or the shortest paths themselves) from a given source vertex v∈V to all other vertices.

Implementation of Algorithm is as follow:

```
dist[s] ←o                          (distance to source vertex is zero)
for all v ∈ V-{s}
    do dist[v] ←∞                   (set all other distances to infinity)
S←∅                                 (S, the set of visited vertices is initially empty)
Q←V                                 (Q, the queue initially contains all vertices)
while Q ≠∅                          (while the queue is not empty)
do  u ← mindistance(Q,dist)         (select the element of Q with the min. distance)
   S←SU{u}                          (add u to list of visited vertices)
   for all v ∈ neighbors[u]
       do if  dist[v] > dist[u] + w(u, v)          (if new shortest path found)
             then   d[v] ←d[u] + w(u, v)          (set new value of shortest path)
               (if desired, add traceback code)
return dist
```

7. FUTURE SCOPE

The project has a very broad scope as it includes newly speed alert system feature which provides the customers smart and secure services anytime, anywhere. Future development is planned to integrate additional communication capabilities to give the Smartphone the ability to allow it to communicate with an automobiles on-board diagnostic system to gain more information about driving conditions. This system would use current road conditions and real-time traffic information from the Internet to assist in the determination of the best route given the conditions. Such a system could be used to provide drivers an evacuation route in emergencies.

8. CONCLUSIONS

The Android platform proved to be capable of supporting a melding of different services. Our sample application showed how GPS data and Google search services could be combined to keep school children safe. Only one type of sensor and one online service was used. Many more novel applications are possible when taking into account Androids extensive sensor capability and Internet access. The open nature of Android forms the foundation of a hitherto untapped reservoir of mobile applications.

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